# EFFECT OF BITUMEN-DERIVED COKE ON DEACTIVATION OF A HYDRODEMETALLATION CATALYST

by

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## ABSTRACT

A large-pore hydrodemetallation catalyst was coked with a solution of anthracene or bitumen in mineral oil in an Autoclave batch reactor to obtain coke levels up to 12%. After Soxhlet extraction and resulfiding, physical properties of the coked catalysts were determined, as well as their catalytic activities for hydrogenation (HYD), hydrodenitrogenation (HDN) and C-N hydrogenolysis (CNH) using a mixture of naphthalene and indole in n-heptane.

It was found that the coke produced via bitumen appeared to be porous, whereas that from anthracene was nonporous. Catalytic activities of the coked catalysts decreased with increasing coke content, with HDN or CNH activity being more deactivated than HYD activity.

The same catalyst was aged in a laboratory flow reactor for a short time with a bitumen feed and the maltene fraction of the bitumen feed in n-heptane solvent. A catalytic activity test was performed in-situ after the aging run. Another activity test was performed on the same catalyst after the catalyst was removed and Soxhlet extracted and resulfided. Two types of carbonaceous deposits were identified on catalysts following the flow aging runs: (1) Coke A catalysts - these consisted of deposits obtained directly after the aging run and activity test. The deposits contained relatively large amounts of condensed polymers and seemed to be related to the flash properties of the feed. Significant losses in catalyst surface area and pore volume were caused by this coke. Catalytic activities were best related to

residual, unblocked surface area and poisoned sites. Hydrogenation sites were appreciably more poisoned than CNH sites; and (2) Coke C catalysts - these contained deposits remaining after further Soxhlet extraction of Coke A catalysts. These deposits were typical of normal coke and tended to reach a limiting value with time. These aged catalysts contained less coke than Coke A catalysts and did not exhibit any loss in surface area and pore volume. Activity tests on these catalysts showed that the results were similar to those of the Autoclave-coked catalysts.

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